

# 2016

## **RESIDENTIAL ALTERNATIVE CALCULATION MANUAL (ACM) APPROVAL METHOD**

For the 20136 Building Energy Efficiency Standards



CALIFORNIA  
ENERGY COMMISSION  
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# 1. Overview

This Manual explains the requirements for approval of residential Alternative Calculation Methods (ACMs or compliance software). Residential Compliance Software is used to demonstrate compliance with the performance approach to the California Energy Efficiency Standards for Low-Rise Residential Buildings (Standards).

The approval procedure is one of self-testing and self-certification by the Compliance Software vendor. The vendor conducts the specified tests, evaluates the results and certifies in writing that the Compliance Software passes the tests. The California Energy Commission (Energy Commission) will perform spot checks and may require additional tests to verify that the proposed Compliance Software is suitable for compliance purposes. The vendor is required to develop a compliance supplement (program user manual) explaining how to use the program to show compliance with the Standards. The compliance supplement must include a tutorial, user guidance for each program input, and an index. The compliance supplement will also be checked by the Energy Commission for accuracy and ease of use.

Residential Compliance Software that implements the 2013~~6~~ Standards must use the energy simulation and compliance rule implementation software specified by the Energy Commission. This open source software, called the Compliance Manager (CM) in this document, will be made available at no cost to potential Compliance Software vendors. The ACM tests submitted by the vendor will confirm that the ~~Compliance Manager has been~~is successfully integrated into the vendor software.

This chapter presents the general requirements for residential compliance software. Chapter 2 describes the required content of the Compliance Supplement. The certification tests that all compliance software must pass are documented in detail in Appendix A. When the CM adds new capabilities or compliance options, the Energy Commission may create additional certification tests. The Residential ACM Reference Manual, a document that is developed and maintained by the Energy Commission to document the details of the performance compliance modeling implemented in the ~~Compliance Manager CM software, and to explain the certification tests all Compliance Software must pass.~~ The Residential ACM Reference Manual is approved by the Energy Commission after the adoption of each Building Energy Efficiency Standards update, and updated as necessary to resolve issues identified during the implementation of the performance compliance approach using Compliance Software.

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## 1.1 Application Checklist

The following is a list of the items that shall be included in an application package for Compliance Software certification by the Commission:

### 1.1.1 Compliance Software Vendor Certification Statement.

A statement from the Ecompliance Software vendor certifying the reliability and accuracy of the software when used for Standards compliance purposes (see Residential ACM Approval Manual Appendix A, Certification Tests).

### 1.1.2 Computer Runs and Summary Sheets.

Copies of the input files for the computer runs specified in the Residential ACM Reference Manual Appendix A, which includes complete all input and output files, the files necessary for transferring information to a HERS provider (currently an XML file format), and summary sheets of the compliance results from all required computer runs (in Excel spreadsheet format), provided electronically to the Commission in computer readable form. Summary sheets of all the required computer runs also provided electronically to the Commission.

Full approval and streamlined approvals will include all test data set files that apply to a program's capabilities.

### 1.1.3 Compliance Supplement.

A copy of the Ecompliance Supplement discussed in Chapter 2. The Ecompliance Supplement and the Ecompliance Software User's Manual may be combined into the same document.

### 1.1.4 ~~Copy of the~~ Compliance Software.

An executable version of the Ecompliance Software for the Energy Commission's use, during the software certification process. The software must include the ability to generate the necessary file to register the documentation with a HERS provider.

### 1.1.5 Application Fee.

An application fee of \$1,000.00 (one thousand dollars) is required to cover the costs of evaluating ~~the an~~ application for full approval. The total fee shall cover the Energy Commission's cost of reviewing and analyzing the application. Within 75 days of receipt of an application, the Commission will provide an estimate of the total maximum cost to review and analyze the application. After the Energy Commission determines the total costs, if the costs exceed the initial fee, the Energy Commission shall assess an additional fee to cover the total costs. If actual cost is less than the initial or any estimated maximum fee, the Energy Commission shall refund the difference to the applicant.

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## 1.2 Types of Approval

This Manual addresses ~~three~~two types of Ecompliance Software approval: full approval, and streamlined approval, of new program features, and amendments to full approvals.

### 1.2.1 Full Approval

Full approval is required when a Compliance Software product has never been previously approved by the Energy Commission or when the Compliance Software vendor makes a change that significantly affects the results. The Energy Commission may also require that all Compliance Software be approved again when the Standards are updated or whenever substantial revisions are made to the approval process.

When ~~re~~-full approval is mandated by the Energy Commission, all Compliance Software vendors will be notified of the renewal timetable. Full approvals must include all items indicated in Section 1.1, Application Checklist. When ~~F~~full approval is not required for all Compliance Software changes, ~~unless they qualify for the streamlined approval process discussed below~~ applies.

### 1.2.2 Streamlined Approval

Certain types of changes may be made to approve Compliance Software compliance software may be approved through a streamlined approval process (see Section . Examples of changes that qualify for streamlined approval are modifications to the user interface or implementation on a different operating system, as long as there are no changes to the compliance results calculated by the software. Changes to the Compliance Manager by the Energy Commission that must be integrated into Compliance Software is another example of when streamlined approval is appropriate. If a Compliance Software modification qualifies for streamlined approval, then the following procedures is followed apply:

- ~~When the Energy Commission makes a minor change to the Compliance Manager, Compliance Software vendors can update their Compliance Software voluntarily upon release of the modified Compliance Manager software, and must update their Compliance Software by January 1 of the following year.~~
- ~~When the Energy Commission makes a major change to the Compliance Manager, Compliance Software vendors can update their Compliance Software voluntarily upon release of the modified Compliance Manager (CM) software, and must update their Compliance Software within 45 days of the CM release date, unless otherwise stated by the Energy Commission in the CM release notice.~~
- The Compliance Software vendor prepares an addendum to the compliance supplement, when appropriate, describing the change to the Compliance Software.
- The Compliance Software vendor notifies the Energy Commission by letter of the change. The letter shall describe in detail the nature of the change and why it is being made. The notification letter shall be included in the Compliance Supplement.
- The Compliance Software vendor provides the Energy Commission data required by Sections 1.1.2, 1.1.3, and 1.1.4 ~~with an updated copy of the Compliance Software.~~
- The Energy Commission responds within 45 days. The ~~Commission~~ response may take several forms. The Energy Commission may approve the updated software, request additional information, refuse to approve the change, or require that the Compliance Software vendor make specific changes to either the Compliance Supplement addendum or the Compliance Software.

- Energy Commission approval is provided to the compliance software vendor in the form of either executive director approval or a resolution.
- With Energy Commission approval, the vendor may issue new copies of the Compliance Software with the Compliance Supplement addendum and notify Compliance Software users and building officials.

### 1.2.3 When Approval Is Not Required

Changes that do not affect compliance with the Standards do not require full or streamlined approval. However, the Compliance Software vendor shall notify the Commission and provide the Energy Commission with an updated copy of the program and user manual. Re-approval is required for any Compliance Software change that affects the compliance results, the format and/or content of compliance forms, or any other change that would affect a building's compliance with the Standards. Any questions regarding applicable approval procedures should be directed to the Energy Commission.

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## **1.3 Amendments Compliance Manager Updates**

~~Compliance Software approval shall be amended when optional modeling capabilities are added. The vendor shall provide the additional computer runs required for the optional modeling capability. It is not necessary to include computer runs previously submitted.~~

~~An amendment to approved Compliance Software shall be accompanied by a cover letter explaining the type of amendment requested, and copies of other documents as necessary. All items on the application checklist should be submitted, when applicable. The timetable for approval of amendments is the same as for full approval.~~

Changes to the compliance manager (CM) are made to correct functional and analytical errors, incorporate software modules to address compliance options approved by the Energy Commission, add building systems, assemblies, and construction materials, or to make any change necessary to accurately estimate the energy use of residential buildings and demonstrate compliance with Standards. Changes to the CM may be a major change, a minor change, or a functional change/bug fix.

### 1.3.1 Major CM Updates

A major change to the CM is any change that is determined to be a significant change in software input or output. Major changes to the CM are reflected in a change to the compliance software version number. Approval of compliance software incorporating a major CM update follows the streamlined approval process.

When a new CM with major changes is released, vendors of compliance software have up to 90 days to incorporate the new CM.

An application to approve a major change in compliance software shall be accompanied by an approval request, and copies of all documents, programs and files as specified in Sections 1.1.1 through 1.1.4. The Executive Director shall make copies of the initial written communications available to interested parties within 30 days. Comments from interested parties must be received within 60 days of the acceptance of the original application.

If the Energy Commission approves the compliance software, approval of previous versions is rescinded effective 90 to 135 days after approval of a new version of compliance software. Versions with rescinded approval may not be used to show standards compliance for new permit applications.

#### 1.3.2 Minor CM Updates

A minor change to the CM is any change that is not a major change. Minor changes to the CM are reflected by appending a letter or sub-number to the compliance software version number. Approval of compliance software incorporating a minor CM update follows the streamlined approval process.

When a new CM with minor changes is released, vendors of compliance software have up to 45 days to incorporate the new CM.

An application to approve a minor change in compliance software shall be accompanied by an approval request, and copies of all documents, programs and files as specified in Sections 1.1.1 through 1.1.4. The Executive Director shall make copies of the initial written communications available to interested parties within 30 days. Comments from interested parties must be received within 60 days of the acceptance of the original application.

If the Energy Commission approves the compliance software, approval of previous versions is rescinded effective 60 to 90 days after approval of a new version of compliance software. Versions with rescinded approval may not be used to show standards compliance for new permit applications.

#### 1.3.3 Changes to the CM for Functionality and Bug Fixes

A change to the CM that affects functionality such as error messages, the appearance of screens, correcting an error that causes an incorrect or unexpected result (a bug fix), or accommodating a new operating system, do not require approval by the Energy Commission. These changes are indicated by appending a version letter or sub-number to the version number.

Compliance vendors may update the compliance software at their discretion. Approval of previous versions will not be rescinded.

#### 1.3.4 Changes Made by Compliance Vendors

When vendors voluntarily update their compliance software, resulting in no change in compliance results (such as error messages, screen appearance) they must notify the Energy Commission of such changes. This type of change is indicated by appending a version letter or sub-number to the version number. Approval by the Energy Commission is not required. Approval of previous versions will not be rescinded.

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#### **1.4 Rescinded Approval**

When new versions of compliance software are approved by the Energy Commission, the approval of previous versions for use with new permit applications expires after a time that will vary from 60 to 135 days.

During the first 30 days following approval of a new version or or rescinded approval of software, the Energy Commission will update the approved 2016 compliance programs website, the Executive Director shall send out a notice to building officials and interested parties announcing the rescinded approval.

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#### **1.31.5 Challenges**

Building officials, program users, program vendors or other interested parties may challenge any residential Ecompliance Software approval. If any interested party believes that a compliance program, an algorithm, or method of calculation used in a Ecompliance Software, or other aspect of a program provides inaccurate results, the party may challenge the program.

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#### **1.41.6 Decertification of Compliance Software**

Decertification is a formal process to withdraw approval of software and is distinct from rescinded approval. Rescinded approval occurs as part of the typical cycle of updating software to account for bug fixes and changes to the compliance manager. The Energy Commission may decertify (~~rescind approval of~~) Ecompliance Software through various means\_:

- All Ecompliance Software products are decertified when the Standards undergo substantial changes, usually occurring with each Standards update.
- Any Ecompliance Software product can be decertified by a letter from the Ecompliance Software vendor requesting that a particular version (or versions) of the product be decertified. The decertification request shall briefly describe the nature of the program errors or "bugs" ~~which~~that justify the need for decertification.
- Any "initiating party" may commence a procedure to decertify a Ecompliance Software product according to the steps outlined below. The intent is to include a means whereby serious program errors, flawed numeric results, improper forms and/or incorrect program documentation not discovered in the certification process can be verified, and use of the particular Ecompliance Software version discontinued. In this process, there is ample



opportunity for the Energy Commission, the Ecompliance Software vendor and all interested parties to evaluate any alleged errors in the Ecompliance Software program.

Following is a description of the process for challenging Ecompliance Software or initiating a decertification procedure:

1. Any party may initiate a review of Ecompliance Software's approval by sending a written communication to the Energy Commission's Executive Director. (The Energy Commission may be the initiating party for this type of review by noticing the availability of the same information listed here.) The initiating party shall:
  - (a) State the name of the Ecompliance Software and the program version number(s) that contain the alleged errors;
  - (b) Identify concisely the nature of the alleged errors in the Ecompliance Software that require review;
  - (c) Explain why the alleged errors are serious enough in their effect on analyzing buildings for compliance to justify a decertification procedure; and
  - (d) Include appropriate data electronically (in a format agreed to by the Energy Commission staff) and/or information sufficient to evaluate the alleged errors.
2. The Executive Director shall make a copy or copies of the initial written communication available to the Ecompliance Software vendor and interested parties within 30 days. Comments from interested parties must be received within 60 days of the acceptance of the original application.
3. Within 75 days of receipt of the written communication, the Executive Director may request any additional information needed to evaluate the alleged Ecompliance Software errors from the party who initiated the decertification review process. If the additional information is incomplete, this procedure will be delayed until the initiating party submits complete information.
4. Within 75 days of receipt of the initial written communication, the Executive Director may convene a workshop to gather additional information from the initiating party, the Ecompliance Software vendor and interested parties. All parties will have 15 days after the workshop to submit additional information regarding the alleged program errors.
5. Within 90 days after the Executive Director receives the application or within 30 days after receipt of complete additional information requested of the initiating party, whichever is later, the Executive Director shall either:
  - (a) Determine that the Ecompliance Software need not be decertified; or
  - (b) Submit to the Commission a written recommendation that the Ecompliance Software be decertified.
6. If the Energy Commission approves the Ecompliance Software decertification, it shall take effect 60 days later. During the first 30 days of the 60-day period, the Executive Director shall send out a Notice to Building Officials and Interested Parties announcing the decertification.

All initiating parties have the burden of proof to establish that the review of alleged Ecompliance Software errors should be granted. The decertification process may be terminated at any time by mutual written consent of the initiating party and the Executive Director.

The Compliance Software vendor may use the 180 to 210-day period outlined here to update the Compliance Software, get it re-approved by the Commission, and release a revised version that does not contain the errors initially brought to the attention of the Commission.

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#### **4.51.7 Alternate Compliance Software Tests**

The Compliance Software vendor may propose alternate tests when the vendor believes that one or more of the standard tests are not appropriate for the Compliance Software. Alternate tests will be evaluated by the Commission and will be accepted if they are considered reasonable. If accepted, the alternate test(s) will be added to ~~the Residential ACM Reference Manual~~ Appendix A as an addendum and the alternate test(s) will be available for use by all Compliance Software vendors.

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#### **4.61.8 Approval of New Exceptional Methods**

The Commission may approve new exceptional methods. Exceptional methods are special modeling capabilities or calculation methods necessary to recognize building features that cannot be adequately modeled with existing Compliance Software. When an Exceptional Method is approved, a new optional capabilities test may be approved as part of the process. To be approved for the new optional capability, vendors shall amend their Compliance Software ~~approval~~.

Even if the Compliance Software already incorporates the Exceptional Method, the vendor shall receive approval to use the Exceptional Method in the compliance process. The Compliance Software vendor shall demonstrate that the Compliance Software ~~automatically~~ uses the correct fixed and restricted inputs for the Exceptional Method and that the standard reports identify the building feature(s) recognized by the Exceptional Method. Additionally, the ACM compliance supplement shall be updated, referencing the use of the new Exceptional Method.

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## 2. Users Manual including Compliance Supplement

Each Compliance Software vendor is required to publish a User's Manual that includes a Compliance Supplement as a component of the users manual. The users manual shall contain sufficient information so that users can develop an understanding of how to ~~run the program and~~ correctly prepare complete and operable files, and how to generate standard compliance documentation. The Compliance Supplement shall describe the specific procedures for using the Compliance Software for compliance with the Building Energy Efficiency Standards. This includes instructions for preparing the building input and using the correct fixed and restricted inputs. ~~In addition, the compliance supplement shall include a list of all error messages and information on how to resolve them.~~ The compliance supplement requirement may be met with a users manual incorporated into the software, however, a printed version of the users manual which includes all help items must be submitted as part of the users manual with the application. ~~that both the performance standards and the Compliance Software are implemented properly.~~

~~. Also included are procedures for generating the standard reports and documenting the analysis. A sample of a properly documented building analysis shall be included.~~

All ~~Users' Manuals'~~ user manuals and Compliance Supplements shall be written in a clear and concise manner and with an organization and format that will allow users to quickly locate the topic and understand the instructions. Also, vendors of approved Compliance Software are required to make copies of their users' ~~manuals~~ manual and compliance supplement available to all building departments in California.

The following sections describe the information that shall be included in all users' manuals. It also presents the required organization for that information.

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### 2.1 Energy Commission Approval

This section includes a copy of the official Energy Commission notice of approval of the Compliance Software. The notice may include restrictions or limitations on the use of the Compliance Software. It will also include the date of approval, and may include an expiration date for approval as well. The notice will indicate any restrictions on its use for compliance. The Energy Commission will provide this notice upon completion of evaluation and approval of the Compliance Software application.

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### 2.2 Software Capabilities

This section discusses the program capabilities, with supporting written material explaining, as necessary, how the Compliance Software treats each one. Reference may be made to ~~non-compliance~~ other sections of the ~~Compliance Software Users Manual~~ for more complete descriptions, if appropriate.

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### 2.3 Standard Input/Output Report

Inputs files shall be organized so that data is presented in the same order as that used by the required output reports.

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### 2.4 Fixed and Restricted Inputs

Approved Ecompliance Software shall automatically use the standard fixed and restricted inputs for the standard design run. It shall also default to the standard assumptions for the proposed design run. When alternative fixed and restricted inputs are used for the proposed design run, the Ecompliance Software shall report this in the *Special Features and Modeling Assumptions* sections of the standard reports.

This section of the Users Manual explains the fixed and restricted inputs and how they are invoked in the Ecompliance Software. This is especially important if the Ecompliance Software offers the possibility of non-compliance runs which can deviate from the fixed and restricted inputs.

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### 2.5 Preparing Basic Input

This section covers the basic use of the Ecompliance Software for compliance. Reference may be made to the Users' Manual, but this section should include a complete summary of all inputs and/or commands necessary for compliance.

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### ~~2.6 Special Features and Modeling Assumptions~~

~~This section explains the use of the Special Features and Modeling Assumptions listing to highlight the importance of verifying the special features and the aspects of those features that were modeled to achieve compliance.~~

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### ~~2.7 Field Verification~~

~~This section explains the use of the Field Verification and Diagnostic Testing listing to highlight the special features that require diagnostic testing by a certified home energy rater under the supervision of an Energy Commission approved HERS provider to assure proper installation and verification. This section may rely on the information provided in Residential Reference Appendix RA3, and other sections of this manual, or may refer to other Commission documents.~~

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### ~~2.82.6 Checklist for Compliance Submittal~~

This section should contain a concise checklist of all items that shall be included in a compliance submittal to a building official using the Ecompliance Software.

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**2.92.7 Sample Compliance Documentation**

This section should include a complete set of compliance documentation for a sample building. The building need not be overly complex, nor need it include every software capability. The example should, however, include all documentation and standard reports that would normally be submitted. This example will serve as a model to ~~C~~compliance ~~S~~software users and building officials of what for a proper compliance submittal should look like.

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**2.102.8 Compliance Statement**

The following statement shall appear within the first several pages of the Supplement:

[Compliance ~~S~~software ~~N~~name] may be used to show compliance with California's 2016 Residential Building Energy Efficiency Standards.

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**2.112.9 Related Publications**

The ~~Users Manual~~user manual should refer users to the following related Energy Commission publications and where to obtain them:

- ~~2013~~2016 *Building Energy Efficiency Standards* (publication number unknown at time of printing)
- ~~2013~~2016 *Residential Compliance Manual* (publication number unknown at time of printing)

Both publications are available from:

California Energy Commission  
Publications Unit  
1516 Ninth Street  
Sacramento CA 95814  
(916) 654-5200